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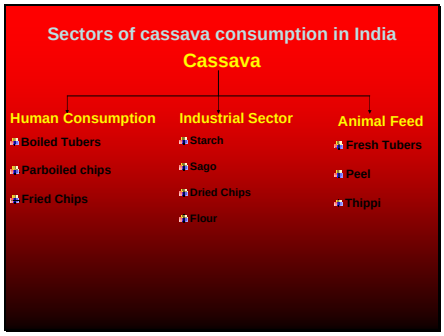

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Objectives

- To understand the current utilization pattern of cassava in different sectors in India.
- To work out the demand for cassava in different sectors of its use
  a. Human consumption sector.
  b. Industry
  c. Animal feed sector.

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Methodology

- Secondary data on consumption expenditure from National Sample Survey Organisation (NSSO) in different years were collected.
- Estimated expenditure elasticities of demand for cassava in human consumption sector.
- Primary data on use of cassava in different industries of its use (Textile, Adhesive, Paper etc.) were collected.

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Methodology

- Estimated the demand for cassava in industrial sector.
- Opinion survey of animal feed nutrition experts in TANUVAS, traders and animal feed manufacturers was made to assess the potential of cassava in animal feed industry.

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Utilisation of cassava in India in 1999-2000

Sector	cassava is Utilised as	Kerala	Tamil Nadu	Andhra Pradesh	Other states	All India
	Actual produced (t)	25,63,500	34,25,500	1,66,100	80,600	62,35,700
	Wastage (15%)	3,84,525	5,13,825	24,915	12,090	9,35,355
	Actual available	21,78,975	29,11,675	1,41,185	68,510	53,00,345
Human consumption	As Fresh tubers	5,44,744 (25%)	2,91,168 (10%)	706 (0.5%)	34,255 (25%)	8,70,873 (16.43%)
	As parboiled chips	1,08,949 (5%)	---	---	---	1,08,949 (2.05%)
	As fried chips	2,17,898 (10%)	2,91,168 (10%)	---	---	5,09,066 (9.6%)

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Utilisation of cassava in India in 1999-2000

Sector	Cassava is Utilised as	Kerala	Tamil Nadu	Andhra Pradesh	Other states	All India
Industry	Sago	2,17,898 (10%)	9,75,000 (33.5%)	60,000 (42.5%)	34,255 (50%)	12,87,153 (24.28)
	Starch	2,17,898 (10%)	9,64,000 (33.11%)	25,000 (17.71%)	---	12,06,898 (22.77)
	Dry chips	21,789 (10%)	3,90,340 (13.41%)	55,479 (39.3%)	---	6,63,717 (12.5%)
Animal feed	As fresh tubers	6,53,693 (30%)	---	---	---	6,53,693 (12.33%)

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Qty. (kg) of cereal substitutes consumed/person for a period of 30 days in different years reported by NSSO

Year/ State	Kerala		Meghalaya		Mizoram		Arunachal Pradesh		All India	
	R	U	R	U	R	U	R	U	R	U
1973-74	6.99	3.64	--	--	--	--	--	--	0.56	0.18
1977-78	5.55	2.59	--	--	--	--	--	--	--	--
1993-94	1.62	0.68	0.42	0.06	0.11	0.02	--	--	0.06	0.04
1994-95	1.10	0.82	--	--	--	--	--	--	0.05	0.04

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Qty. (kg) of cereal substitutes consumed/person for a period of 30 days in different years reported by NSSO

Year/ State	Kerala		Meghalaya		Mizoram		Arunachal Pradesh		All India	
	R	U	R	U	R	U	R	U	R	U
1995-96	1.05	0.43	--	--	--	--	--	--	0.04	0.03
1996-97	0.87	0.40	--	--	--	--	--	--	0.03	0.03
1998	1.09	0.54	--	--	--	--	--	--	0.05	0.03
1999-2000	0.96	0.45	0.40	0.12	0.05	--	0.22	0.14	0.05	0.03

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Expd. elasticities for different expenditure groups on cereal substitutes in Kerala

Expd. Group	1977-78		1983		1999-2000	
	R	U	R	U	R	U
1	2.304	5.725	2.347	3.249	0.003	-0.025
2	1.058	2.787	1.601	2.156	-1.796	0.966
3	0.770	1.789	1.210	1.477	0.834	0.761
4	0.522	0.956	0.953	1.074	1.076	0.104
5	0.402	0.511	0.789	0.786	0.411	1.649
6	0.342	0.327	0.629	0.536	-0.360	0.739
7	0.279	0.119	0.498	0.310	0.257	0.499
8	0.220	-0.076	0.377	0.115	0.275	0.704
9	0.177	-0.219	0.269	-0.064	0.450	0.601
10	0.149	-0.318	0.175	-0.216	0.467	0.357
11	0.118	-0.423	0.092	-0.358	0.166	0.665
12	0.075	-0.568	0.036	-0.447	0.519	0.491
All	0.145	-0.457	0.253	-0.086	0.357	0.356

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Expd. elasticities for different expenditure groups on Cereal substitutes in India

Expd. Group	1999-2000	
	Rural	Urban
1	0.124	0.567
2	0.405	0.560
3	0.539	0.557
4	0.355	0.324
5	0.684	0.738
6	0.423	0.642
7	0.553	0.659
8	0.367	0.470
9	0.674	0.458
10	0.616	0.395
11	0.452	0.499
12	0.431	0.582
All	0.472	0.417

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Projected demand for cassava in Kerala in human consumption sector. (1999-2000 as base period)

Projected Year	Projected Demand (Lakh tonnes)
2005-06	2.93
2010-11	3.27
2015-16	3.76

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HISTORICAL PERSPECTIVE

- First Indian starch industry: 1938 Bharat Starch & Chemicals Ltd. Jamnanagar, Punjab
- First Indian Tapioca Starch Industry: 1943 in Tamil Nadu; Late 1960s in Andhra Pradesh.
- Presently there are 3 large scale cassava starch plants and 800 small scale industries producing more than three lakh tonnes of cassava starch.

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Uses of cassava starch

- Food industry: Sago pearls, Sago wafers, Stabilisers and Thickeners.
- Textile industry: In warp sizing, improve weaving efficiency, thickeners in printing inks for textiles.
- Adhesives: Paper conversion industry, Corrugating adhesives, stationery gums.
- Paper industry: Improves paper's tensile, bursting and directional strengths , smoothness, resistance to oil and water.
- Other industries: Pharmaceuticals, Plywood etc.

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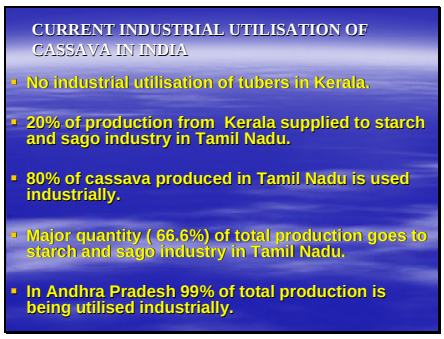

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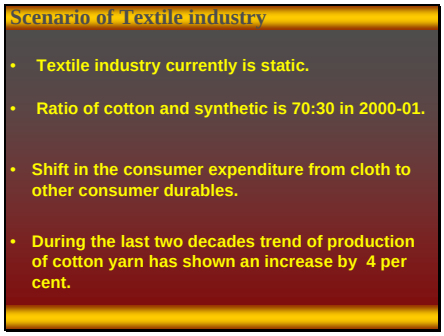

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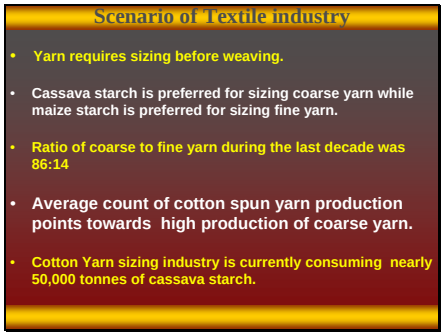

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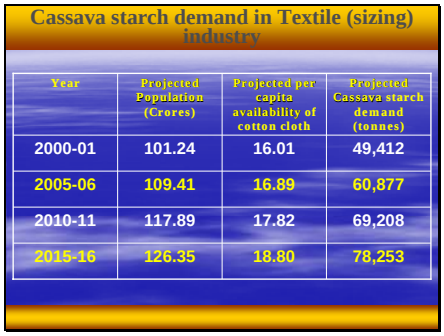

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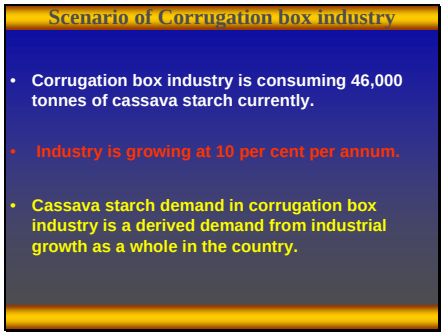

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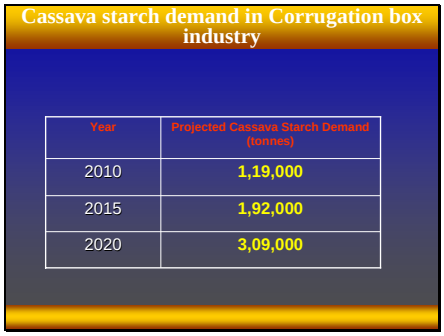

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Scenario of Paper conversion industry

- Kraft paper and cassava starch or maize starch or Yellow dextrins are the important raw material in making paper conversion products.
- Paper cones and Paper tubes are the important paper conversion products.
- There are 600 paper cone making units and 400 paper tube making units in India using starch based adhesives.
- Starch is used in making paper cones and yellow dextrins are used in making paper tubes.

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Scenario of Paper conversion industry

- Currently the industry is stagnant due to unremunerative prices and stiff competition.
- South based units are consuming tapioca starch and its based yellow dextrins, while north based units are using maize starch.
- Currently this industry is consuming 34,500 tonnes of cassava starch.
- At a nominal growth of one per cent, projected requirement of cassava starch for 2020 will be nearly 42,000 tonnes.

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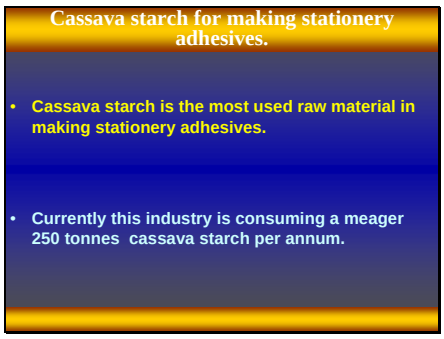

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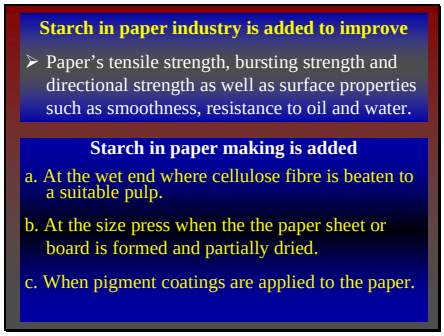

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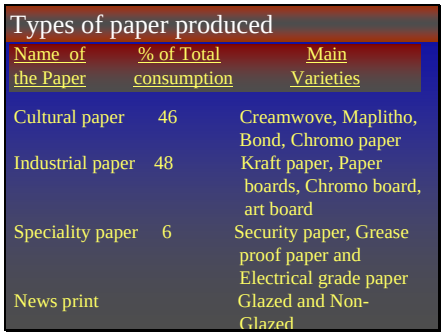

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Demand for paper depends on

- GDP growth
- Increase in per capita income
- Literacy rate
- Growth of service sector
- Advancement of printing technology in the country
- Development of packaging industry
- Development of paperless transaction

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Projected Demand for starch in paper industry in India

Year	Projected Population (Crores)	Projected per capita consumption of paper & paperboard in Kg @ 6% growth	Projected demand for paper & paperboard (million mt)	Starch requirement for different types of paper at different use levels (lakh tonnes) 2%	2.5%	3.0%
2000-01	101.24	4.55	4.61	0.92	1.15	1.38
2005-06	109.41	6.09	6.66	1.33	1.67	1.99
2010-11	117.09	8.15	9.54	1.91	2.39	2.86
2015-16	126.35	10.90	13.78	2.75	3.44	4.13

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Industry wise projections of starch requirement

Industry		1999-2000 (t)	2005-06 (t)	2010-11 (t)	2015-16 (t)
Textile		50,000	60,877	69,208	78,253
Corrugation adhesives		46,000	1,19,000	1,92,000	3,09,000
Paper conversion		34,500	36,800	38,700	40,600
Stationery adhesives		200	220	240	260
Paper at	2%	46,000	66,000	95,000	1,37,000
	2.5%	57,000	83,000	1,20,000	1,72,000
	3%	69,000	99,000	1,43,000	2,06,000
Others		25,000	30,000	35,000	40,000
Total demand	2%	2,01,700	3,12,897	4,30,148	6,05,113
	2.5%	2,12,700	3,29,897	4,55,148	6,40,113
	3%	2,24,700	3,45,897	4,78,148	6,74,113

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Demand-Supply projections for cassava starch in India

Projected Period	Demand (t)	Supply (t)	Gap (t)
2005-06	3,12,897 (15,64,485)	2,65,387 (13,26,936)	47,510 (2,37,549)
2010-11	4,30,148 (21,50,740)	3,09,791 (15,48,957)	1,20,357 (6,01,783)
2015-16	6,05,113 (30,25,565)	3,54,196 (17,70,978)	2,50,917 (12,54,587)

Note: Figures in parentheses indicate the tuber equivalent of starch.

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Demand-Supply projections for sago in India

Projected Period	Demand (t)	Supply (t)	Gap (t)
2005-06	2,64,793 (16,25,245)	2,09,441 (12,56,644)	55,352 (3,68,601)
2010-11	2,85,341 (17,51,372)	2,41,724 (14,50,342)	43,617 (3,01,030)
2015-16	3,05,819 (18,77,054)	2,74,007 (16,44,040)	31,812 (2,33,014)

Note: Figures in parentheses indicate the tuber equivalent of sago.

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Prospects of Cassava starch Industry

- Growing demand for cassava starch in adhesive sector and paper industry.

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Current Livestock Population

Cross bred cows	3.0 million
Milk cows of non-descript Breeds	52.0 million
Buffaloes	25.0 million
Poultry birds	80.0 million
Layers	50.0 million
Broilers	30.0 million

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Demand for Total feeds

Feed	Demand in million tonnes Current	2010
Cattle Feed	28.75	30.00
Poultry feed	13.25	38.00
Total Feed	42.00	68.00

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Composition of Cattle Feed in a Private Feed Mix Plant in A.P

Ingredient	Content as per cent in Formulation 1	Formulation 2	Formulation 3
Maize	10	10	8
G. nut cake	--	--	3
Cotton seed cake	5	5	5
Sunflower cake	10	10	7
Rice bran	5	--	10
Wheat bran	5	10	--

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Composition of Cattle Feed in a Private Feed Mix Plant in A.P

Ingredient	Content as per cent in Formulation 1	Formulation 2	Formulation 3
G.Nut hul bran	5	5	3
Cassava waste	**4**	**5**	**8**
DORB	37.5	36.5	37.5
Molasses	13	13	13
Urea	1.5	1.5	1.5
Calcite	2.0	2.0	2.0
Salt	2.0	2.0	2.0

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Compound Feed Manufactured by CLFMA –Zone wise (Lakh tonnes)

Zone	Member Number	Cattle	Poultry	Total	% of Total
East	20	0.68	1.32	2.00	6.8
North	14	0.55	1.31	1.87	6.4
West	38	7.80	3.30	11.11	**37.8**
South	48	6.00	8.18	14.38	**49.0**
Total	102	15.03	14.11	29.36	100.0

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Projected cassava demand in animal feed in organized sector (million tonnes)

Year	Projected CF by CLFMA in India	South	CF with cassava waste at 5%	10%
2005-06	3.0	1.52	0.07	0.15
2010-11	4.0	2.03	0.10	0.20
2015-16	5.4	2.70	0.13	0.27

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Conclusions

- Demand for cassava in human consumption sector is declining at rapid rate.
- Cassava starch demand is more in adhesive industry than in textile industry.
- Demand for cassava starch is increasing in paper industry.
- Demand for cassava fresh tuber as animal feed is present only in Kerala.

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Conclusions

- Demand for cassava waste for making compound feed was observed mostly in South India.
- Projected cassava demand in animal feed sector for 2010-11 and 2015-16 was 0.1 and 0.13 million tonnes respectively.
- Demand supply gap in cassava starch and sago require an additional area of 0.75 lakh ha to be brought under cassava cultivation especially in non-traditional areas.

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